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25 JUN 2004

PPPO-01-580-04

Mr. Bharat Mathur
Acting Regional Administrator
U.S. Environmental Protection Agency
Region 5
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NATIONAL EMISSIONS STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP) RADIONUCLIDE EMISSIONS REPORT (CALENDAR YEAR 2003) FOR THE U.S. DEPARTMENT OF ENERGY'S PORTSMOUTH GASEOUS DIFFUSION PLANT, PIKETON, OHIO

Dear Mr. Mathur:

Enclosed please find a certified copy of the annual NESHAP report submitted in accordance with 40 CFR 61.94 (subpart H) for airborne emissions of radionuclides from the U.S. Department of Energy's (DOE's) Portsmouth Gaseous Diffusion Plant (PORTS) during calendar year (CY) 2003.

The PORTS site has operations conducted by two separate entities. DOE performs environmental restoration and waste handling activities while the United States Enrichment Corporation (USEC) maintains the enrichment facilities at PORTS in a "cold standby" status. The enclosed report addresses the emissions from DOE operations only; however, it also includes the total dose value associated with USEC operations conducted at PORTS. USEC will be submitting a separate report addressing the emissions from USEC operations. The combined dose to the most exposed individual resulting from both DOE and USEC operations was 0.04 millirem (mrem) for CY 2003, which is below the regulatory standard of 10 mrem per year.

If you should have any questions or need additional information, please contact me at (859-219-4000.

Sincerely,

William E. Murphie
Manager
Portsmouth/Paducah Project Office

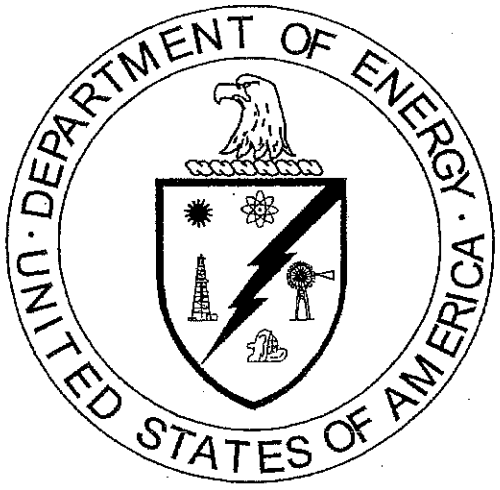
Enclosures

cc w/enclosure:
Administrative Records
Mike Murphy, USEPA/Region 5

cc w/o enclosure:
Gilbert D. Drexel, BJC/PORTS
Rosemary Richmond, BJC/PORTS

DOE/OR/11-3149&D1

Radiological National Emission Standards for Hazardous Air Pollutants (NESHAP) 2003 Annual Report for the Department of Energy Portsmouth Gaseous Diffusion Plant, Piketon, Ohio



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per review by:
Henry H. Thomas 6/9/04
BJC ETTP Classification & Information Office Date

DOE/OR/11-3149&D1

Radiological National Emission Standards for Hazardous Air Pollutants (NESHAP) 2003 Annual Report for the Department of Energy Portsmouth Gaseous Diffusion Plant, Piketon, Ohio

Date Issued—June 2004

Prepared by
EQ Midwest, Inc.
Cincinnati, OH
under subcontract 23900-SC-SM002F

Prepared for the
U.S. Department of Energy
Office of Environmental Management

BECHTEL JACOBS COMPANY LLC
managing the
Environmental Management Activities at the
Paducah Gaseous Diffusion Plant Portsmouth Gaseous Diffusion Plant
under contract DE-AC05-03-OR22980
for the
U.S. DEPARTMENT OF ENERGY

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment. See, 18 U.S.C. 1001.

WE Murphie

William E. Murphie
Manager
Portsmouth/Paducah Project Office
U.S. Department of Energy

6/25/04

Date

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ACRONYMS

CFR	Code of Federal Regulations
Ci	curie
DOE	U.S. Department of Energy
EDE	effective dose equivalent
EPA	Environmental Protection Agency
HEPA	high efficiency particulate
MEI	maximally exposed individual
mrem	millirem
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System
pCi	picocurie
PORTS	Portsmouth Gaseous Diffusion Plant
USEC	United States Enrichment Corporation

EXECUTIVE SUMMARY

This report provides the information required by Title 40 of the Code of Federal Regulations (CFR) Part 61, National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart H, National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy (DOE) Facilities. The regulations, administered by the U.S. Environmental Protection Agency (EPA), require this annual report.

DOE is responsible for five unmonitored minor emission sources at the Portsmouth Gaseous Diffusion Plant (PORTS): the X-326 L-cage Glovebox, X-744G Glovebox, X-622 Groundwater Treatment Facility, X-623 Groundwater Treatment Facility, and X-624 Groundwater Treatment Facility. The X-622, X-623, and X-624 Groundwater Treatment Facilities are included because these facilities treat groundwater that is contaminated with radionuclides and are therefore sources of radionuclide emissions. The United States Enrichment Corporation (USEC) is responsible for additional sources associated with the gaseous diffusion process and other operations.

Radionuclide emissions from the DOE sources are modeled by the CAP88 computer program (approved by U.S. EPA) to determine the dose to residents living around the PORTS facility. In 2003, the X-744G Glovebox and X-326 L-cage Glovebox were not used; therefore, emissions from the X-622, X-623, and X-624 Groundwater Treatment Facilities were used to determine the dose.

In 2003, the effective dose equivalent (EDE) to the maximally exposed individual (MEI) based on DOE PORTS emissions was 0.0066 mrem/year. To determine compliance with NESHAP regulations, the DOE PORTS EDE is combined with the USEC EDE for each individual to determine a total EDE from the PORTS facility at each receptor location. The maximum USEC EDE in 2003 was 0.033 mrem/year and was the same location as the DOE MEI. The EDE to the MEI based on both USEC and DOE emissions was 0.040 mrem/year, which is below the NESHAP standard of 10 mrem/year.

Summary of the EDE (mrem/year) to the DOE and USEC MEI

MEI	Location [distance (meters), direction, and DOE source]	EDE from DOE sources	EDE from USEC sources	Combined EDE
DOE & USEC	2301 NE of X-622 1067 ENE of X-623 640 E of X-624	0.0066	0.033	0.040

DOE collects samples from 15 ambient air monitoring stations on and around the PORTS reservation and analyzes them for the radionuclides that could be present in ambient air due to PORTS activities. These radionuclides are isotopic uranium (uranium-233/234, uranium-235, uranium-236, and uranium-238), technetium-99, and selected transuranic isotopes (americium-241, neptunium-237, plutonium-238, and plutonium-239/240). The ambient air monitoring stations measure radionuclides released from the DOE and USEC point sources, fugitive air emissions, and background concentrations of radionuclides.

The CAP88 model was used to generate a dose conversion factor that was used to calculate a dose (in mrem/year) for a given activity of each radionuclide in air (in pCi/m^3). A dose was computed for each ambient air monitoring station. The net dose for each ambient air monitoring station (subtracting the dose measured at the background station) ranged from zero (at stations with a gross dose less than the background station) to 0.0014 mrem/year. The highest net dose measured at the ambient air monitoring

1. FACILITY INFORMATION

1.1 SITE DESCRIPTION

The Portsmouth Gaseous Diffusion Plant (PORTS) is owned by the U.S. Department of Energy (DOE). In 1992, Congress passed legislation amending the Atomic Energy Act of 1954 to create the United States Enrichment Corporation (USEC) to operate the uranium enrichment enterprise in the United States. The new corporation began operation on July 1, 1993 and privatized in 1998. In accordance with the Act, USEC leased all production facilities at PORTS and its sister plant at Paducah, Kentucky, from DOE. In June 2001, USEC ceased enrichment operations at PORTS. DOE reached an agreement with USEC to maintain the enrichment facilities at PORTS in cold standby status until further notice. This report covers only the DOE operations at PORTS.

DOE activities at the PORTS site include waste management, environmental restoration, environmental monitoring, and operation of nonleased facilities. Environmental monitoring consists of two major activities: effluent monitoring and environmental surveillance. Effluent monitoring is direct measurement or the collection and analysis of samples of liquid and gaseous discharges to the environment. Environmental surveillance is direct measurement or the collection and analysis of samples of air, water, and soil. Environmental monitoring is performed to characterize and quantify contaminants, assess radiation exposures to members of the public, demonstrate compliance with applicable standards and permit requirements, and detect and assess the effects (if any) of DOE activities on the local environment. Multiple samples are collected throughout the year and are analyzed for radioactivity, chemical content, and various physical attributes.

The PORTS site is located in sparsely populated, rural Pike County, Ohio, on a 16.2-km^2 (6.3-mile^2) site about 1.6 km (1 mile) east of the Scioto River Valley at an elevation of approximately 36.6 m (120 ft) above the Scioto River floodplain. The terrain surrounding the plant, except for the Scioto River floodplain, consists of marginal farmland and densely forested hills. The Scioto River floodplain is farmed extensively, particularly with grain crops.

Pike County has a generally moderate climate. Winters in Pike County are moderately cold, and summers are moderately warm and humid. The precipitation is usually well distributed with fall being the driest season. Prevailing winds at the site are out of the southwest to south. Average wind speeds are about 5 mph (8 km/h), although winds of up to 75 mph (120 km/h) have been recorded at the plant site. Usually, high winds are associated with thunderstorms that occur in spring and summer. Southern Ohio is within the Midwestern tornado belt, but no tornadoes have struck the plant site to date.

Pike County has approximately 27,700 residents. Scattered rural development is typical; however, the county contains numerous small villages such as Piketon, Wakefield, and Jasper that lie within a few kilometers of the plant. The county's largest community, Waverly, is about 19 km (12 miles) north of the plant site and has a population of approximately 4,400 residents. Additional population centers within 80 km (50 miles) of the plant are Portsmouth (population 20,909), Chillicothe (population 21,796), and Jackson (population 6,184) (2000 U.S. Census). The total population of the area lying within an 80-km (50-mile) radius of the plant is approximately 600,000.

2. RADIONUCLIDE EMISSIONS

2.1 UNMONITORED SOURCES

Emissions from the X-622, X-623, and X-624 Groundwater Treatment Facilities are based on periodic air emissions testing. The most recent testing was completed from January through March 2001 (X-623 and X-624 facilities) and March 2002 (X-622 facility). Emissions from each facility are estimated by calculating the number of operating hours during 2003 for each facility and assuming that the highest emissions rate recorded for each radionuclide during air emissions testing was emitted during each hour of operation. Section 4.5 provides additional information concerning the emissions testing for each facility.

Hours of operation for each facility were calculated using the throughput for each facility (in gallons per minute) and the amount of water treated by each facility. The hours of operation for each facility in 2003 were 5994 hours (X-622), 2677 hours (X-623), and 1381 hours (X-624).

To reduce emissions from the groundwater treatment facilities, a de-mister is installed on the air stripper at X-622 and off-gas carbon units are installed on the air strippers at the X-623 and X-624 facilities.

Table 1 lists the activity of the selected air monitoring radionuclides released from the X-622, X-623, and X-624 Groundwater Treatment Facilities in 2003.

Table 1. Emissions (Ci/year) from DOE PORTS air emission sources in 2003

Radionuclide	X-622 Groundwater Treatment Facility		X-623 Groundwater Treatment Facility	X-624 Groundwater Treatment Facility
	Air stripper	Clarifier		
Americium-241	9.4E-08	4.8E-08	1.0E-06	1.3E-06
Neptunium-237	4.0E-08	7.0E-09	9.9E-07	1.9E-06
Plutonium-238	4.1E-08	1.4E-08	6.4E-07	9.0E-07
Plutonium-239/240[a]	2.6E-08	7.2E-09	5.6E-07	1.1E-06
Technetium-99	9.6E-07	9.2E-08	5.1E-05	6.1E-05
Uranium-233/234[a]	-	-	1.4E-06	1.8E-06
Uranium-234	2.8E-05[b]	1.9E-06[b]	-	-
Uranium-235	6.4E-08[b]	4.3E-09[b]	3.2E-07	6.4E-07
Uranium-236	-	-	4.3E-07	6.2E-07
Uranium-238	1.8E-07[b]	1.2E-08[b]	6.7E-07	9.0E-07
Total	2.9E-05	2.1E-06	5.7E-05	7.0E-05

[a]Plutonium-239/240 is entered as plutonium-239 and uranium-233/234 is entered as uranium-234 in the CAP88 model.
[b]Emissions of uranium isotopes from the X-622 Groundwater Treatment Facility are calculated based on the concentration of total uranium detected during emission testing of this facility (see Sect. 4.5.2 for further information).

3. DOSE ASSESSMENT

3.1 DESCRIPTION OF DOSE MODEL

CAP88-PC Version 2, a computer program approved by EPA for compliance with 40 CFR Subpart H, was used to calculate the dose from DOE PORTS radionuclide emissions to air. The program uses a modified Gaussian plume equation to estimate the dispersion of radionuclides. The program computes radionuclide concentrations in air, rates of deposition on ground surfaces, concentrations in food, and intake rates to people from ingestion of food produced in the assessment area.

3.2 SUMMARY OF INPUT PARAMETERS

Input parameters for the CAP88 model include physical parameters for each radionuclide emission source, radionuclide emissions, meteorological data, and agricultural data. Table 1 (Sect. 2.1) provides the radionuclide emissions for each source. Default values were used for the size and class of each radionuclide. Table 3 provides the physical parameters for each source.

Table 3. Physical parameters for DOE air emission sources

Parameter	X-622 Groundwater Treatment Facility		X-623 Groundwater Treatment Facility	X-624 Groundwater Treatment Facility
	Air stripper	Clarifier		
Stack height (m)	8.1	8.1	7.6	6.1
Stack diameter (m)	0.2	0.1	0.2	0.2
Exit velocity (m/sec)	2.9	2.6	15.5	20.6

Site-specific meteorological data was used in the CAP88 model. Data collected for calendar year 2003 includes:

Annual precipitation:	118 cm/year
Average air temperature:	11.3 °C
Average mixing layer height:	1000 meters

The wind file used in the CAP88 model was also generated from data collected at the 30-meter height from the on-site meteorological tower.

Note that the default values provided with the CAP88-PC model can be very conservative. The rural food array used to estimate the DOE PORTS dose assumes that the public obtains all foodstuffs within 50 miles of the plant (see Table 4). In reality, the majority of the foodstuffs consumed are purchased at supermarkets that receive foodstuffs from all over the world.

4. ADDITIONAL INFORMATION

4.1 NEW/MODIFIED SOURCES

No new facilities or modifications to existing facilities as defined under NESHAP regulations were initiated or completed at DOE PORTS during 2003.

Although the DOE PORTS ambient air monitoring stations are not sources of radionuclide emissions, DOE PORTS submitted a request to U.S. EPA in August 2003 to modify equipment at the ambient air sampling stations. The modification request was to install permanent duplicate sampling equipment on the low volume sampling train (the portion of the equipment used to sample fluorides) at each ambient air station. U.S. EPA approved this request in a letter to DOE dated December 1, 2003. The duplicate sampling equipment will be installed in 2004.

4.2 UNPLANNED RELEASES

There were no unplanned releases of radionuclides during 2003.

4.3 DOSE CALCULATIONS FOR EVALUATION OF DIFFUSE/FUGITIVE EMISSIONS

In October 2000, DOE assumed control of the ambient air monitoring stations at PORTS. Samples are collected weekly from 15 stations (see Fig. 1) and composited monthly. The ambient air monitoring stations measure radionuclides released from the DOE and USEC point sources (see Sect. 3), fugitive air emission sources such as those discussed in Sect. 2.2, and background concentrations of radionuclides.

Samples were analyzed for selected transuranics (americium-241, neptunium-237, plutonium-238, plutonium-239/240), technetium-99, and uranium isotopes (uranium-233/234, uranium-235, uranium-236, and uranium-238). Uranium-233/234 and uranium-238 were detected in all of the ambient air samples collected in 2003. Uranium-235 was detected in approximately half the samples collected during 2003. Uranium-236 was detected in one sample collected at four stations (A3, A23, A24, and T7) and in four samples collected at station A36. Americium-241 and neptunium-237 were not detected in any of the ambient air samples collected in 2003. Plutonium-238 was detected in one sample collected at station A9 and plutonium 239/240 was detected in one sample collected at station A10. Technetium-99 was detected once at five stations (A9, A12, A23, A41 and T7) and twice at station A36.

The CAP88 model was used to generate a dose conversion factor for each radionuclide. The dose conversion factor is used to compute a dose in mrem/year for a given activity of a radionuclide in air (in pCi/m^3). For radionuclides that were detected in ambient air, the dose for that radionuclide was calculated by using the maximum concentration of each detected radionuclide. For radionuclides that were never detected, the dose was calculated by using half the detection limit to calculate the maximum concentration of the radionuclide in air. The doses attributable to each radionuclide were then added to obtain the gross dose for each station. The net dose was obtained by subtracting the dose at station A37, the background monitoring station (the net dose is recorded as zero for stations with a gross dose less than the background station). Table 6 summarizes the total dose (both gross and net) for each station. The highest net dose for the ambient air monitoring stations was 0.0014 mrem/year at station A41.